REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

In the specification, paragraph [0001] has been amended and replaced with a rewritten paragraph.

Claims 1, 4, 7, 24, and 31 are currently being amended. No new matter is added.

This amendment changes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1-15 and 24-31 remain pending in this application.

In paragraph 2 of the Office Action, the Examiner objected to the specification for informalities. Applicants have amended the specification in accordance with the Examiner's suggestions. No new matter is added.

In paragraphs 3 and 4 of the Office Action, claims 4 and 31 are rejected under 35 U.S.C. § 112, second paragraph. Applicants respectfully traverse the rejection of claim 4. Units are not necessary and indeed not appropriate for a percentage representation. The specification states:

> Fluorination step 44 causes a slight loss or reduction in the thickness of layer 30, typically in the range of a few angstroms. However, the remaining thickness of layer 30, including the surface fluorinated feature 50, will have a much enhanced etch stability or etch resistance in comparison to its unfluorinated counterpart. In one embodiment, the etch stability is increased by approximately 20%-50%. Etch stability is also referred to as hardness. See present application page 9, ¶ 34.

Claim 4 clearly states that etch stability is increased by 20%-50%. To increase clarity, claim 4 has been amended to recite that the etch stability is increased by 20%-50% as compared to the etch stability of the photoresist layer before exposure to the plasma.

With respect to claim 31, claim 31 has been amended to recite that the feature is at least one of a conducting line, a gate for a transistor device, a contact hole, a via structure or a trench. Applicants believe that this amendment overcomes the rejection of claim 31.

Applicants note that the amendments to claim 4 and 31 are non-limiting amendments and have been made for the purpose of clarity only. No new matter has been added. Accordingly, withdrawal of the rejection of claims 4 and 31 is respectfully requested.

In paragraphs 5-7 of the Office Action, claims 1-11, 13-15, 24-29 and 31 are rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,207,583 (Dunne) in view of U.S. Patent No. 6,054,254 (Sato). The Examiner states:

> Dunne discloses a method comprising: providing a photoresist layer . . . exposing the photoresist later to a plasma, the photoresist layer including exposed surfaces . . .; transforming the exposed surfaces to form a shell (22043), wherein the shell increases the etch stability of the photoresist layer (Col. 8, Fig. 1D, Fig. 5B). Dunne fails to disclose a specific thickness of the photoresist layer. In a semi-conductor process, Sato discloses a photoresist layer (8) having a thickness of 200 nm is sufficient to act as a mask . . . . It would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify Dunne in view of Sato by having the thickness less than 0.25 micrometers because it would be sufficient to act as a mask.

Applicants respectfully traverse the rejection.

The method of the present invention utilizes a process in which the photoresist is transformed before a subsequent etching, doping or implantation step. An IC process which transforms the photoresist before further processing with the transformed photoresist is discussed throughout the present application. See Figure 2, present application. The present application

describes one embodiment of the process as follows: "Upon completion of fluorination step 44, pattern transfer to underlying layers, such as, layer 28 can occur using etching step 46." See present application, page 9, ¶ 35. Further, the advantage of the transformation of the photoresist is described as follows:

> The exposed surfaces are densified, becoming harder or structurally more rigid, and therefore more resistant to high-energy ions and/or reactive radicals present in the plasma processes that will be used to subsequently etch the layers of wafer 24 not covered by layer 30.

See present application, page 9, ¶ 31 (*emphasis added*).

Each of independent claims 1, 7 and 21 explicitly recites that the transformation step is before a further processing step. Claim 1 specifically recites:

> transforming the exposed surfaces to form a shell ... before using the photoresist layer to etch an underlying layer.

Claim 7 specifically recites:

> etching the substrate in accordance with the transformed feature ... .

Claim 24 specifically recites:

> transforming the exposed surfaces ... and etching or doping the layer or substrate according to the feature.

Accordingly, each of independent claims 1, 7 and 21 are specifically related to a process in which the photoresist layer is transformed before subsequent etching, doping or implanting steps.

In direct contrast to the present invention, Dunne does not disclose such a process. The transformation of the photoresist layer occurs during the etching step. See Dunne, col. 8, lines 13-24. There is no step performed prior to the etching of vias 20 which transforms the photoresist layer. Similarly, crust 43 is formed when vias are etched. See Dunne, Col. 8, lines

46-48. Indeed, Dunne describes the formation of hardened crust 22 as a disadvantageous process which requires specialized stripping. This is contrary to the principles of the present invention which intentionally transforms the photoresist layer to make it harder. Sato is not cited in this rejection of claims 1-11, 13-15, 24-29 and 31 for the transformation of the photoresist layer before an etching, doping or implantation step. Therefore, it is respectfully submitted that the rejection of claims 1-11, 13-15, 24-29 and 31 be withdrawn.

In paragraph 8 of the Office Action, claim 12 is rejected under 35 U.S.C. § 103 as being unpatentable over Dunne and Sato and further in view of U.S. Patent No. 6,500,605 (Mullee).

The Examiner states:

> Both Dunne and Sato disclose a step of densifier the photoresist layer. However, Dunne and Sato failed to explicitly disclose that the densifier as an ion implantation. Mullee discloses a step of ion implantation to create a hard crust....

In paragraph 9 of the Office Action, claim 30 is rejected under 35 U.S.C. § 103 as being unpatentable over Dunne and Sato and further in review of U.S. Patent No. 6,319,655 (Wong). Applicants respectfully traverse the rejections. Dunne, Sato, Wong and Mullee are referred to below as the cited art.

As discussed above, Dunne does not show, describe or suggest the process of transforming a photoresist before a subsequent etching, doping or implantation step. Dunne and Sato fail to disclose the use of fluorine and argon and/or electron beams to transform the photoresist layer. Accordingly, even if Dunne, Sato, Wong and Mullee are combined, there is no teaching for the use of this specific techniques for transforming the photoresist recited in independent claims 1, 7 and 21. Accordingly, it is respectfully submitted that claims 1, 7 and 21 are patentable over the cited art.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

Atty. Dkt. No. 039153-0310 (F0797)

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 06-1447.

Respectfully submitted,

Date 2-6-04

By _____

FOLEY & LARDNER
777 East Wisconsin Avenue, Suite 3800
Milwaukee, Wisconsin 53202-5306
Telephone: (414) 297-5768
Facsimile: (414) 297-4900

Joseph N. Ziebert
Attorney for Applicant
Registration No. 35,421